Department of Transportation
Federal Aviation Administration
Aircraft Certification Service
Washington, DC

TSO-C119a

Date: 4/9/90

Technical Standard Order

Subject: TSO-C119a, TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (TCAS) AIRBORNE EQUIPMENT, TCAS II

a. Applicability.

(1) Minimum Performance Standard. This technical standard order (TSO) prescribes the minimum performance standard that traffic alert and collision avoidance system (TCAS) airborne equipment, TCAS II, must meet in order to be identified with the applicable TSO marking. Traffic alert and collision avoidance system (TCAS) airborne equipment, TCAS II, that are to be so identified and that are manufactured on or after the date of this TSO must meet the minimum operational performance standards set forth in Radio Technical Commission for Aeronautics (RTCA) Document No. DO-185, "Minimum Operational Performance Standard for Traffic Alert and Collision Avoidance System (TCAS) Airborne Equipment," Section Two (2), Change 1, dated March 22, 1985; Change 2, dated September 20, 1985; Change 3, dated March 25, 1986; Change 4, dated May 15, 1987; Change 5, dated March 18, 1988; and Change 6, dated September 29, 1989.

(2) Exception. Reference RTCA Document No. DO-185, Volume 1, Changes 1 through 6, Section 2.2.8.9.1, Mode S Surveillance Initiation, change "shall" to "may" in the requirement that reads "Squitters that contain an all 0's or all 1's Mode S address or an address identical to that of own aircraft transponder shall be rejected."

Section 2.2.10.4, Transponder Performance Validation, disregard requirement that states, "In addition, the Mode S transponder Monitor shall declare a transponder failure in the event that own Mode S address is all 0's or all 1's."

(3) Environmental Standard. The conditions and procedures prescribed in RTCA Document No. DO-160C, "Environmental Conditions and Test Procedures for Airborne Equipment" dated December 4, 1989 are to be used in lieu of RTCA Document No. DO-160B, "Environmental Conditions and Test Procedures for Airborne Equipment," dated July 1984.

(4) Computer Software. If the equipment design implementation includes a digital computer, the computer software must be verified and validated in an acceptable manner. One acceptable means of compliance for the verification and validation of the computer software is

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A-FAC-0 (MAX); A-X (CD)-4: AVN-1 (2 cys)

outlined in RTCA Document No. DO-178A, "Software Considerations in Airborne Systems and Equipment Certification," dated March 1985. For those applicants who elect to use RTCA Document No. DO-178A to demonstrate compliance for the verification and validation of the computer software, the following requirements must be met:

(i) The RTCA Document DO-178A defines three levels of software: Levels 1, 2, and 3. The applicant must declare the level (or levels) to which the computer software has been verified and validated. If the equipment incorporates more than one software level, appropriate partitioning of different software levels is required. The software for Resolution Advisory (RA) functions must be verified and validated to at least Level 2.

(ii) The applicant must submit a software verification and validation plan for review and approval.

NOTE: The FAA strongly recommends early discussion and agreement between the applicant and the FAA on the applicant's proposed software verification and validation plan, and the applicant's proposed software level or levels.

b. Marking. In addition to the marking specified in Federal Aviation Regulations (FAR) Section 21.607(d), the following information shall be legibly and permanently marked on the major equipment components:

(1) Each separate component of equipment that is manufactured under this TSO (antenna, receiver, sensors, display panels, etc.) must be permanently and legibly marked with at least the name of the manufacturer, the TSO number, and part number.

(2) With regard to FAR Section 21.607(d)(2), the part number is to include hardware and software identification, or a separate part number may be utilized for hardware and software. Either approach must include a means for showing the modification status.

(3) The level(s) to which the computer software has been verified and validated.

c. Data Requirements.

(1) In addition to FAR Section 21.605, the manufacturer must furnish the Manager, Aircraft Certification Office (ACO), Federal Aviation Administration, having purview of the manufacturer's facilities, one copy of each of the following technical instructions.

(i) Operating instructions.

(ii) Equipment limitations.

(iii) Installation procedures and limitations.

(iv) Schematic drawings, as applicable to the installation Procedures.

(v) Wiring diagrams, as applicable to the installation procedures.

(vi) Specifications.

(vii) List of the major components (by part number) that make up the equipment complying with the standards prescribed in this TSO.

(viii) An environmental qualification form, as described in RTCA Document No. DO-160C.

(ix) Manufacturer's TSO qualification test report.

(x) Nameplate drawings.

(xi) The appropriate documentation as defined in RTCA Document No. DO-178A, or equivalent, necessary to support the verification and validation of the computer software to Level 1, Level 2, or Level 3. If the software is verified and validated to more than one level, the appropriate documentation for each level of software must be submitted.

(2) In addition to those data requirements that are to be furnished directly to the FAA, each manufacturer must have available for review by the Manager of the ACO having purview of the manufacturer's facilities, the following technical data.

(i) A drawing list, enumerating all the drawings and processes that are necessary to define the article's design.

(ii) The functional test specification to be used to test each production article to ensure compliance with this TSO.

(iii) Equipment calibration procedures.

(iv) Corrective maintenance procedures (within 12 months after TSO authorization).

(v) Schematic drawings.

(vi) Wiring diagrams.

(vii) The appropriate documentation, as defined in RTCA Document No. DO-178A, or equivalent, necessary to support the verification and validation of the computer software to Level 1, Level 2, or Level 3. If the software is verified and validated to more than one level, the appropriate documentation for each level of software must be available for review.

(viii) The results of the environmental qualification tests conducted in accordance with RTCA DO-160C.

d. Data to be furnished with manufactured units. One copy of the data and information specified in paragraphs (c)(l)(i) through (viii) of this TSO, and instructions for periodic maintenance and calibration which are necessary for continued airworthiness must go to each person receiving for use one or more articles manufactured under this TSO. In addition, a note with the following statement must be included:

> "The conditions and tests required for TSO approval of this article are minimum performance standards. It is the responsibility of those desiring to install this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards. The article may be installed only if further evaluation by the applicant documents an acceptable installation and is approved by the Administrator."

e. Availability of Reference Documents.

(1) Copies of RTCA Document Nos. DO-185, Changes 1 through 6, DO-160C, and DO-178A may be purchased from the Radio Technical Commission for Aeronautics Secretariat, One McPherson Square, Suite 500, 1425 K Street, NW, Washington, DC 20005.

(2) Federal Aviation Regulations Part 21, Subpart O, and Advisory Circular 20-ll0F, "Index of Aviation Technical Standard Orders," may be reviewed at the FAA Headquarters in the Aircraft Certification Service, Aircraft Engineering Division (AIR-120), and at all regional ACO's.

/S/ John K. McGrath
Acting Manager, Aircraft
Engineering Division